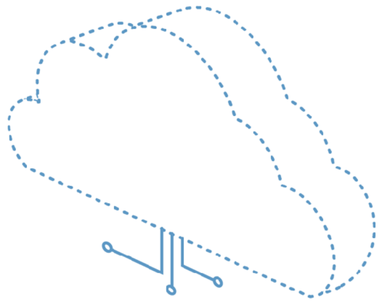
SMARTernak

Solusi IoT untuk Optimalkan Peternakan



Andri Yadi
CEO, DycodeX

#ILDEX2019 - ICE BSD City - Sep 19, 2019

About Me

Andri Yadi

Co-founder & CEO of DycodeX

Deputy Chairman, Indonesia IoT Association

a (at) dycodex.com | http://andriyadi.com

A Physicist, Developer, Maker, Community Guy, Entrepreneur

Microsoft Most Valuable Professional (**MVP**) of Azure for **12 years**
Code for food & passion for **20 years**
Break & make **electronic** stuffs for **22 years**
Trying to change the world through **entrepreneurship**, **15 years** now

DYCODEX

PT. DycodeX Teknologi Nusantara

The Company

Our vision is to solve big problems with technology.

Today, we're pioneering and leading in developing end-to-end home-grown **Artificial Intelligence (AI)** & **Internet of Things (IoT)**-based products & solutions in Indonesia, and enable **maker movement** along the way.

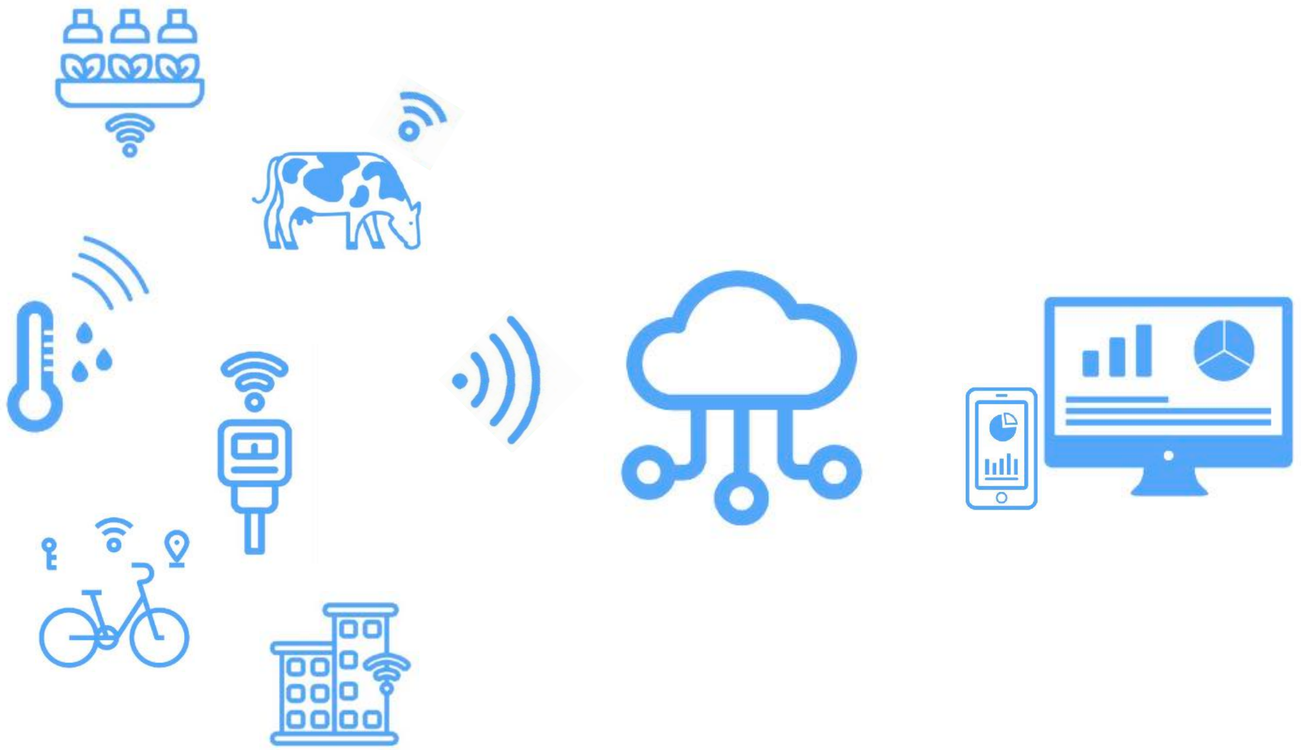
Only a few of startups in the country capable of doing both AI & IoT, in-house!

As seen on

YAHOO! NEWS · Google · DailySocial.id · e27 · INFOKOMPUTER · TECHINASIA · CNN Indonesia · METRO TV · Bloomberg TV INDONESIA · BERITA SATU · Pikiran Rakyat · SWA

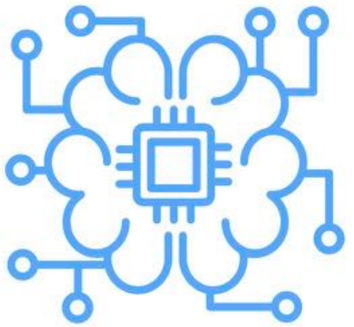
Approach

We approach our solutions to be powered by **AI + IoT**, end to end



IoT is about automated data collecting,
storing, visualisation, and reacting, in massive scale

“Data Supplier”



AI is about making sense of the massive data,
providing insights & recommendation,
and predicting the future outcome

“Data Miner”

Combining AI + IoT (AIoT) enables a lot of opportunities!

In 2030

8.5 B
People

1.8 B
cattle*

400 M Tones
meat*

1.2 B Tones
milk to produce

*FAO

Food & Agriculture Organization

"Livestock sector is one of the **fastest growing** parts of the agricultural economy, contributing **40%** of the global value of agricultural output and support the food security of **1.3 billion people**"

"Indonesia will be self-sufficient in beef in the next **10 years**"

Ir. Joko Widodo,
President of Indonesia

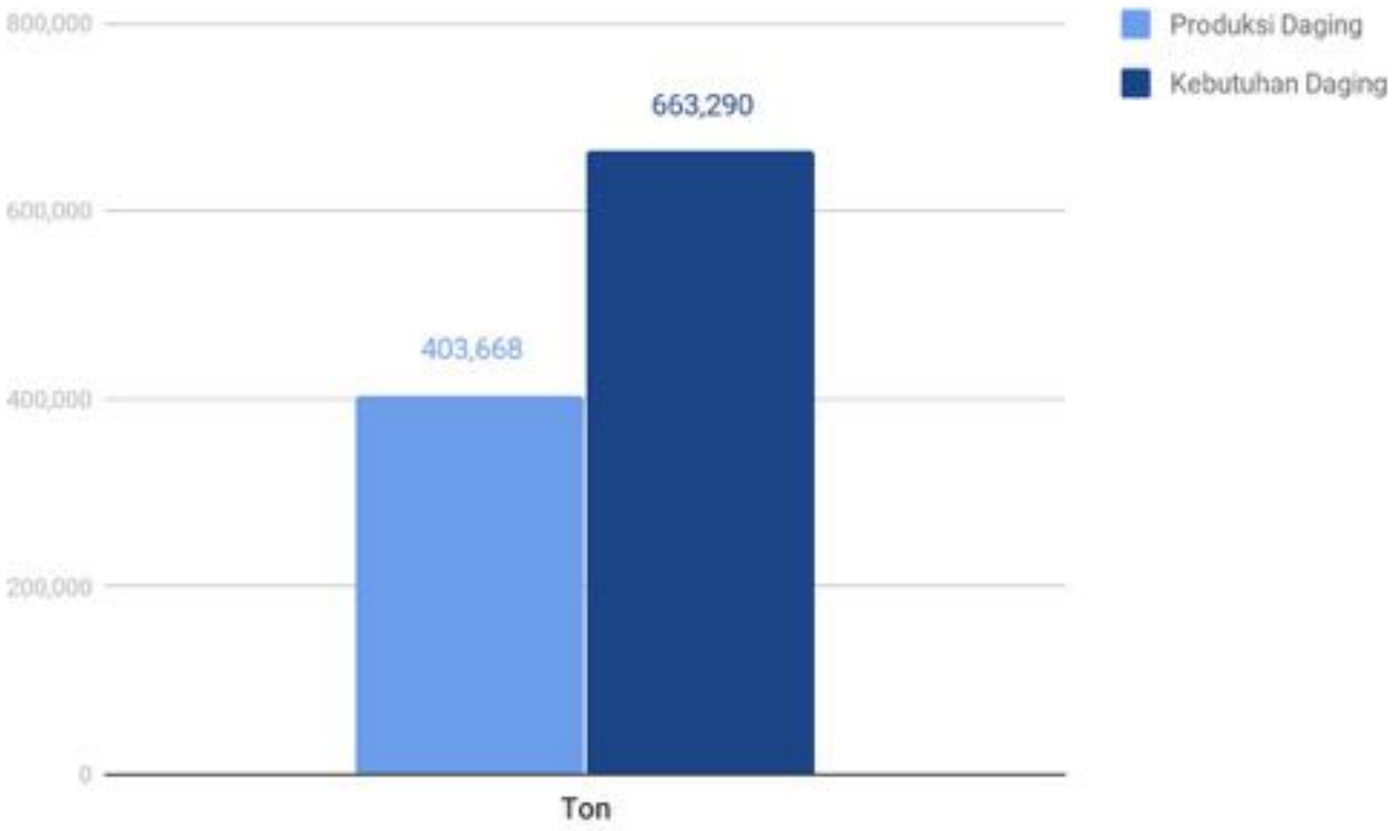
Program Strategis **Kementan**

- Mempercepat peningkatan populasi sapi di tingkat peternak
- Memperkuat aspek pembenihan dan pembibitan
- Penambahan indukan impor
- Pengembangan Hijauan Pakan Ternak
- Penanganan gangguan reproduksi
- Penyelamatan sapi betina produktif
- Penanggulangan dan pemberantasan penyakit hewan

Source: http://bisnis.liputan6.com/read/3029593/jurus-pemerintah-capai-swasembada-daging

Our Challenges...

Indonesia's beef supply is still less than **60%** out of demands



Source: "259.662 Ton Kebutuhan Daging Dipenuhi dari Impor". CNBC Indonesia. Diakses 27 Februari 2019.

Cattle farming still has real world problems

"We have no reliable means to track **feeding behaviour**. Non-eating cows are often found dead after 2-3 days"

A personal farm, Subang - Indonesia
Manages **400+** cows

HERD COUNTING

"We often **lose count** when a herd of cows moves from one to another grazing area"

A corporate farm**,** Indonesia, manages **8000+** cows

OPERATION EFFICIENCY

"We have to **visit hundreds of cows every day**, just to check whether they still move or not"

Cattle Breeding Centre - Ministry of Agriculture
Manages **1400+** cows

Other Problems

Ternak kerap keguguran di usia kehamilan tertentu.

(Sumber: Merdeka Sapi Keguguran)

Risiko kematian karena peternak terlambat mengidentifikasi penurunan nafsu makan.

Ternak berpenyakit karena peternakan yang tak rutin dibersihkan, dan berisiko menyebar ke ternak lainnya.

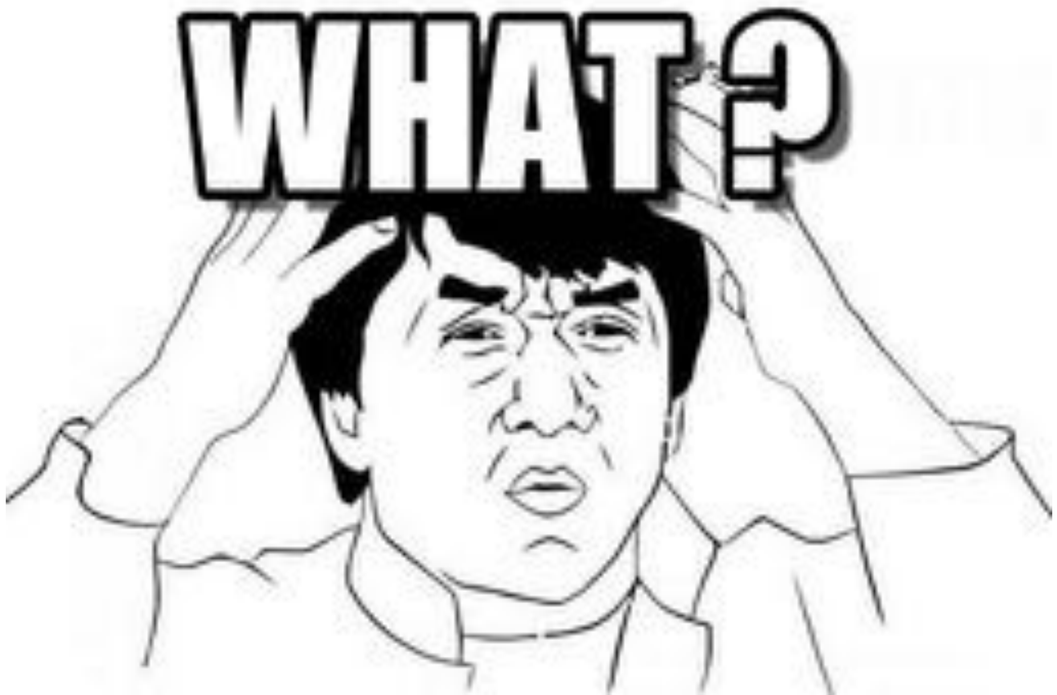
(Sumber: Sapi Bagus)

Sulitnya melacak lokasi ternak, khususnya di peternakan ekstensif.

Minimnya data akurat seputar sapi produktif (siap potong) yang dimiliki pemerintah, pribadi, dan swasta.

Let's solve the problems with the help of "Deep Tech"

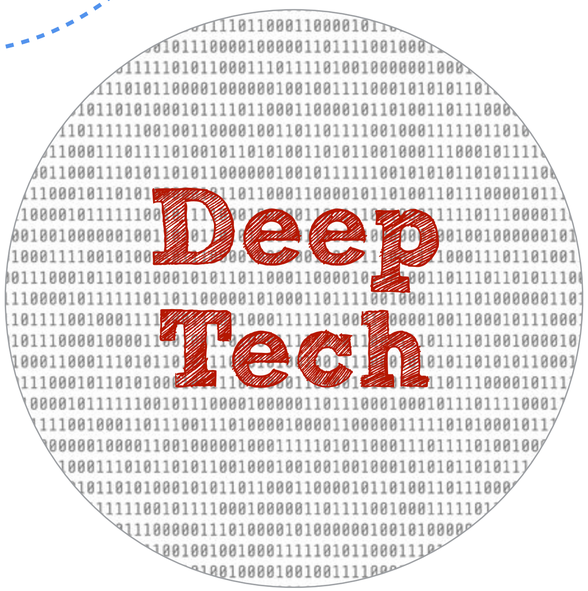
But, what is “Deep Tech”?



Artificial Intelligence

Blockchain

Internet of Things

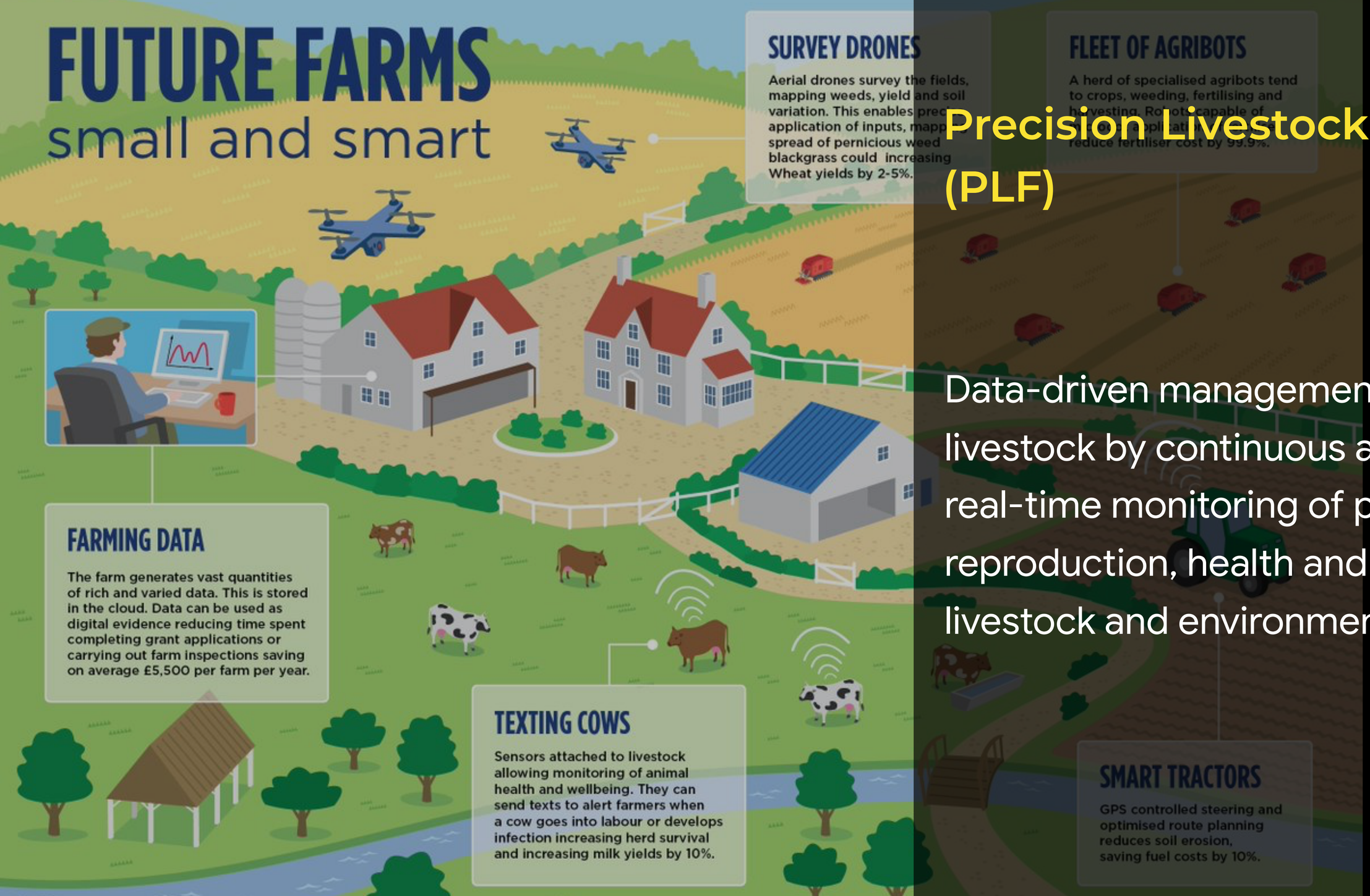


Robotics

Chemistry

Life Science

Green Energy



Precision Livestock Farming (PLF)

Data-driven management of livestock by continuous automated real-time monitoring of production/ reproduction, health and welfare of livestock and environmental impact.

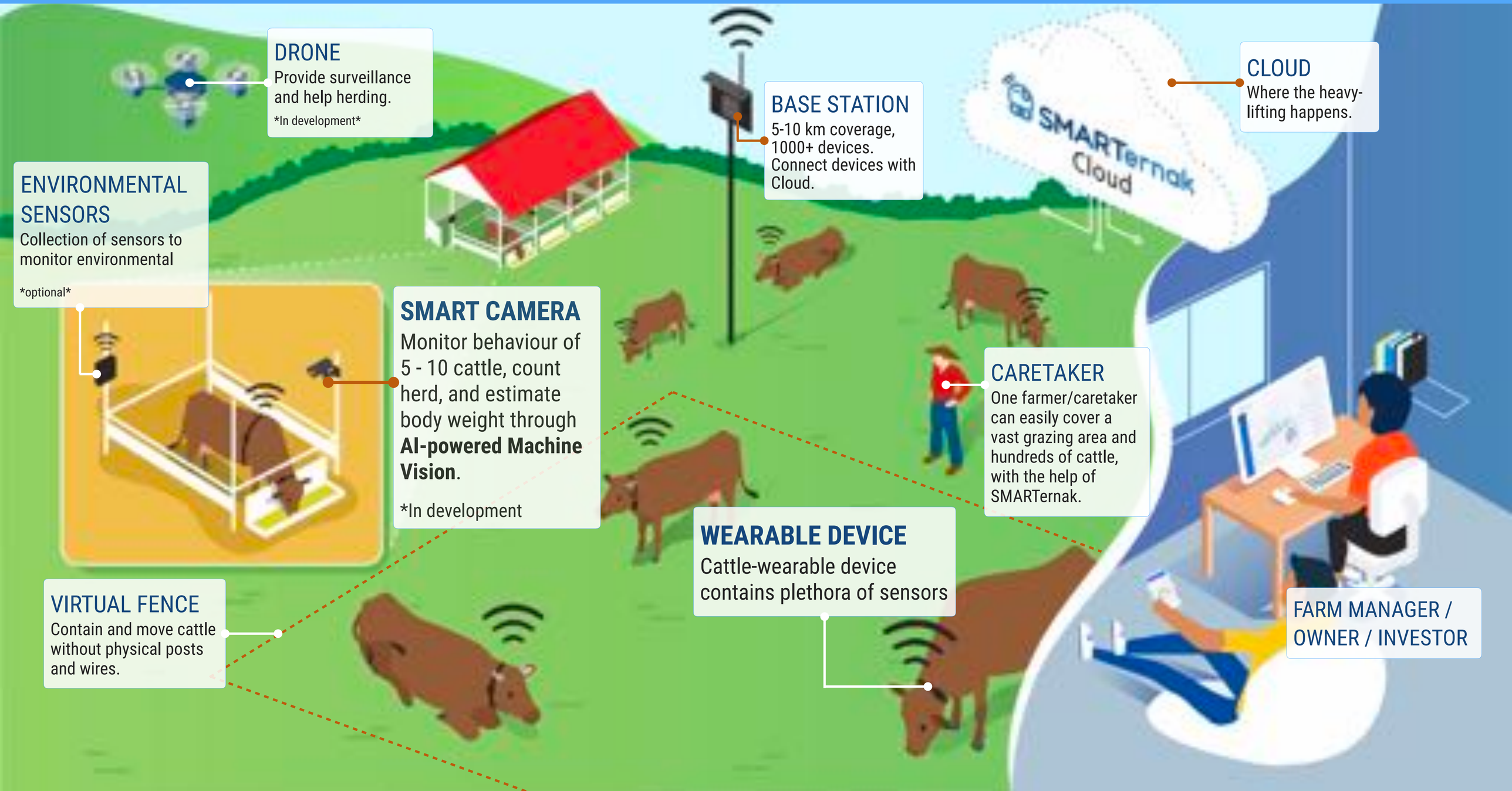
Introducing...

SMARTernak

Internet of Things & Artificial Intelligence-powered Cattle-Farm Assistant Platform

* “Ternak” in SMARTernak means “cattle” in Bahasa Indonesia

SMARTernak: How It Works



DRONE
Provide surveillance and help herding.

In development

BASE STATION
5-10 km coverage, 1000+ devices. Connect devices with Cloud.

CLOUD
Where the heavy-lifting happens.

ENVIRONMENTAL SENSORS
Collection of sensors to monitor environmental

optional

SMART CAMERA
Monitor behaviour of 5 - 10 cattle, count herd, and estimate body weight through **AI-powered Machine Vision**.

*In development

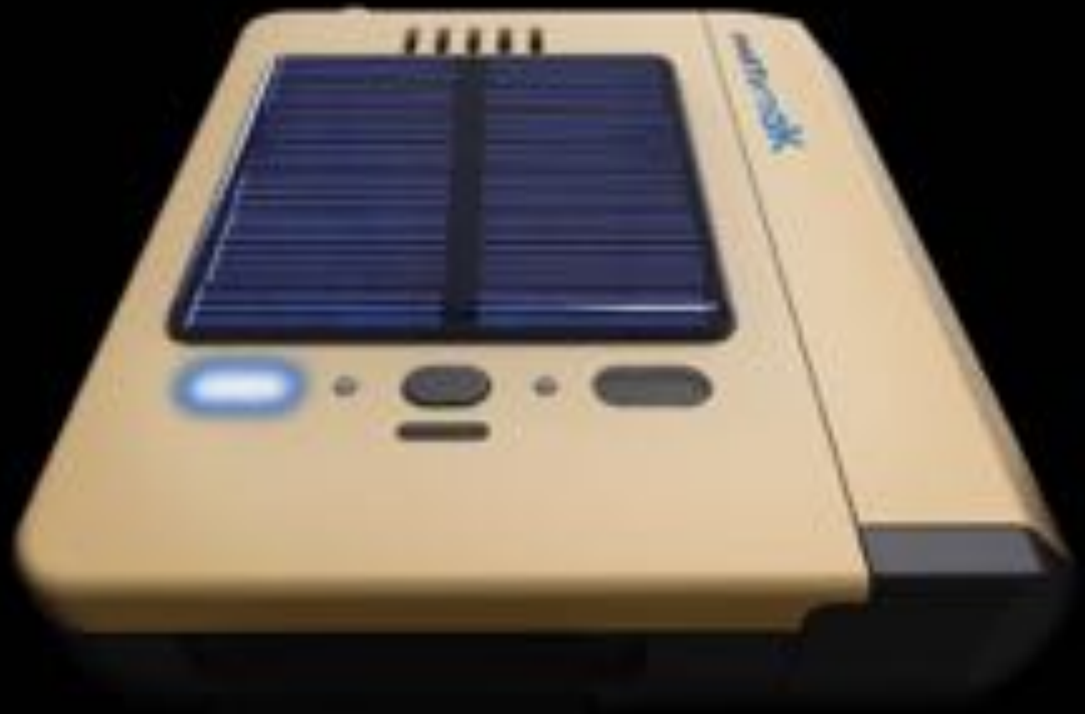
CARETAKER
One farmer/caretaker can easily cover a vast grazing area and hundreds of cattle, with the help of SMARTernak.

WEARABLE DEVICE
Cattle-wearable device contains plethora of sensors

VIRTUAL FENCE
Contain and move cattle without physical posts and wires.

FARM MANAGER / OWNER / INVESTOR

Cattle-wearable Device



SMARTernak is about platform. It's open to 3rd party devices.

Wearable Device Internals

Electronic board is 100% designed in-house, mass-produced in Indonesia, by 100% Indonesian

Dual IoT Connectivity

Short Range: 1 km WiFi, Bluetooth v4.2, BLE
Mesh-supported. High speed, e.g. for firmware update

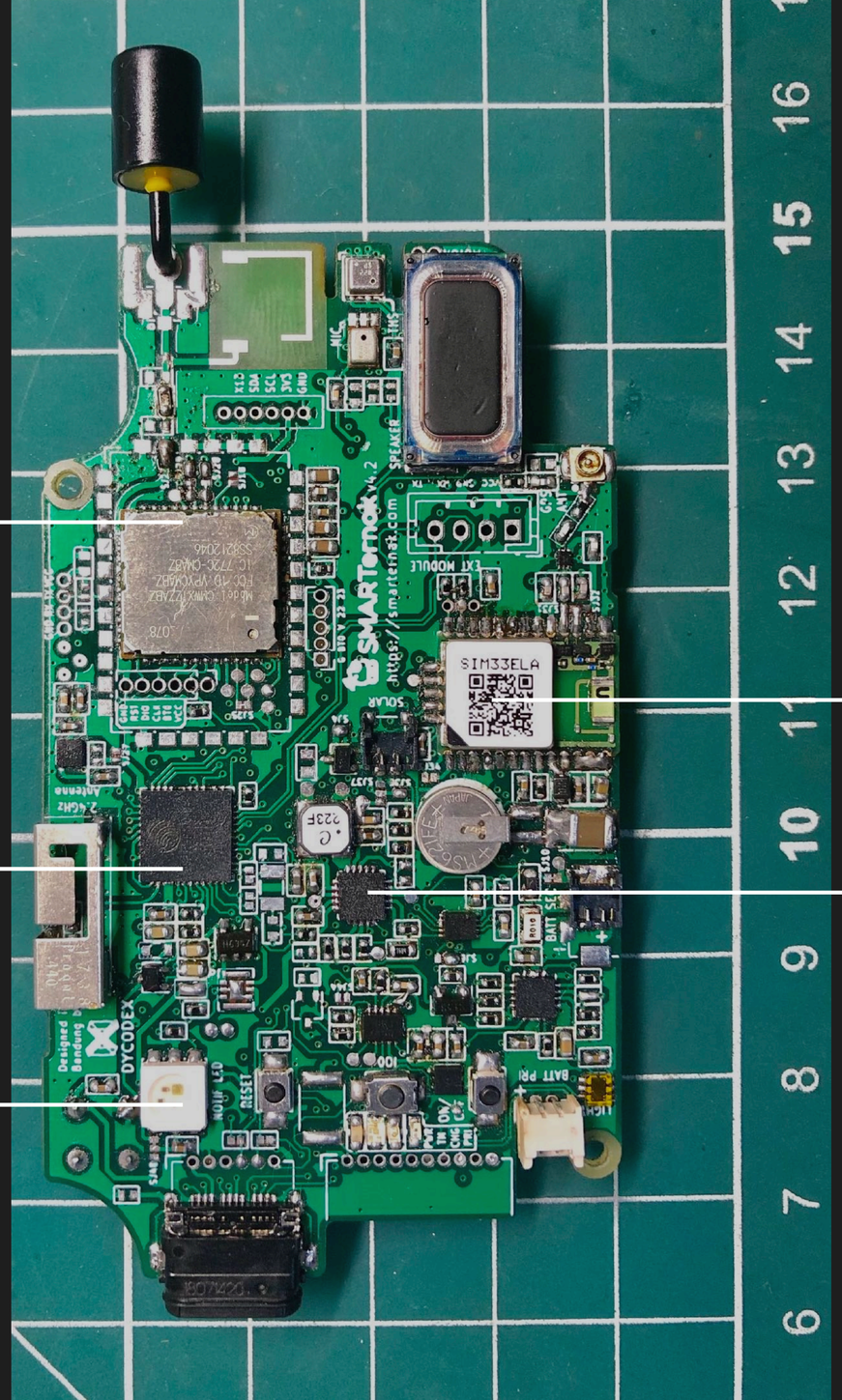
Long Range: **LoRa/LoRaWAN or NB-IoT,**
for 5-10km coverage area

Powerhouse

Low Power, Dual Core Microcontroller
with on-device ML inference

Actuators

Audio Alert/Speaker
Color LED



Packed with Sensors

GPS / GNSS
Accelerometer, Gyroscope
Body Temperature
Ambient Temperature & Humidity
Barometric Pressure
Ambient Light
MEMS Microphone
Device Removal Detector

Smart Energy

Battery Gauge
Solar Energy Harvesting
Smart Switching Between Main & Backup Battery
Fast Charging from USB Type-C
Firmware-optimised power consumption

Monitoring

Monitor cattle's where-about & well-being parameters

On-farm Smart Camera:

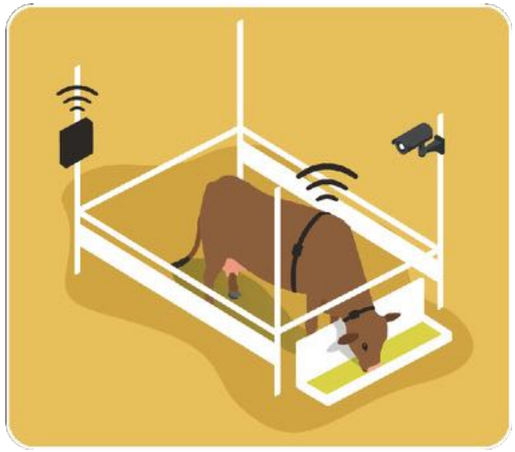
Monitor activity of 5 - 10 cattle - focus on group activity,

Count herd & movement

Estimate weight*

Environmental Sensors:

Monitor ambient temperature, humidity, and air quality in barn



Cattle-wearable device:

Precisely monitor each cattle for:

Location (latitude, longitude, movement speed, direction)

Body temperature

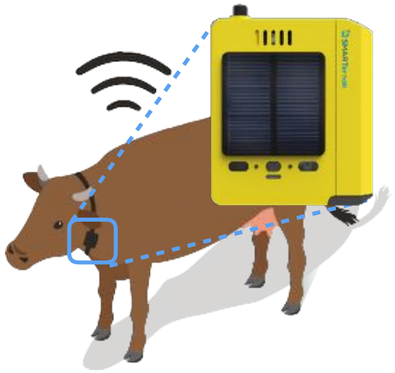
Ambient temperature & humidity

Ambient light & sound

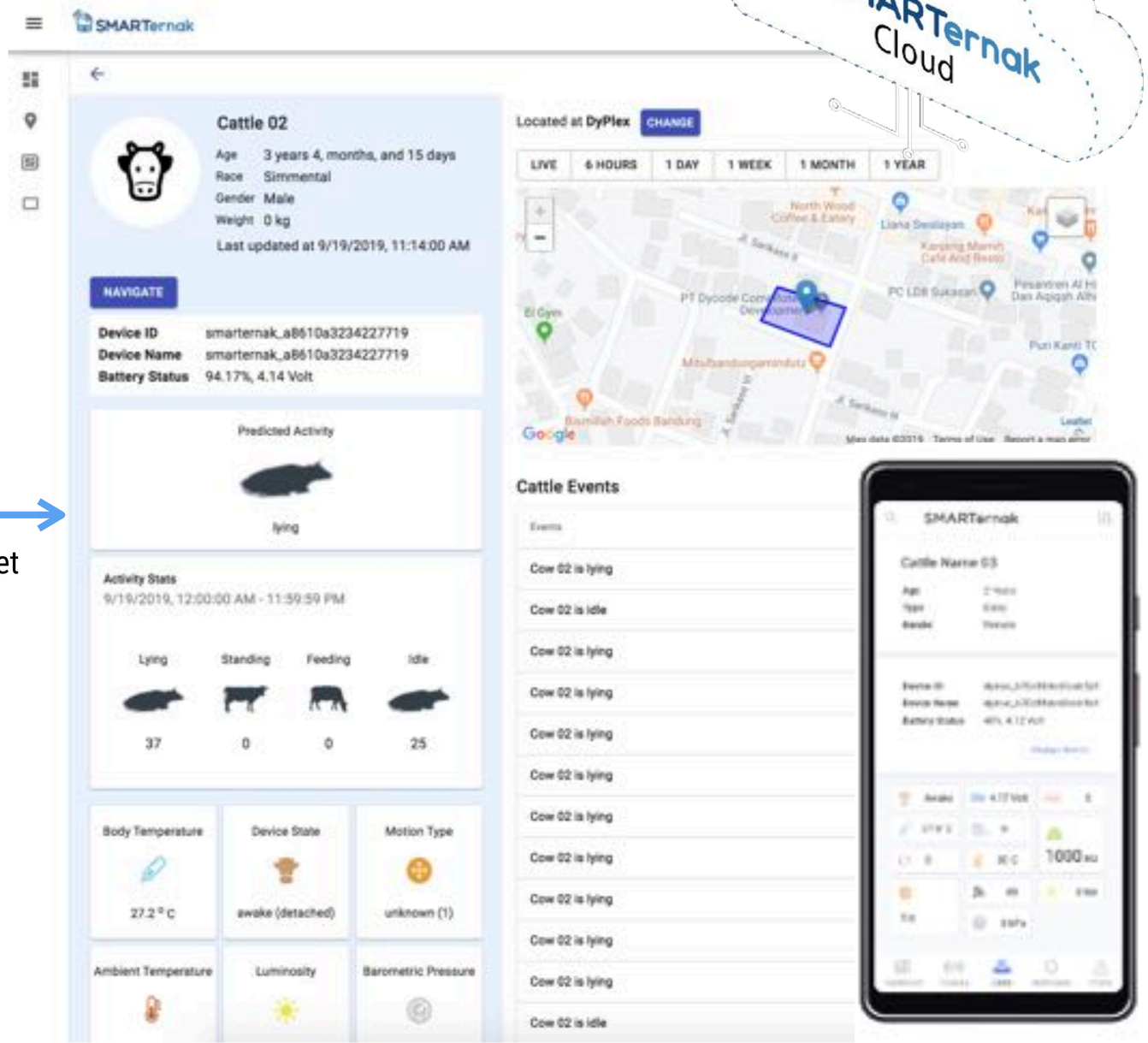
Movement (linear acceleration, angular velocity, direction)

Device removal status

Battery voltage & capacity

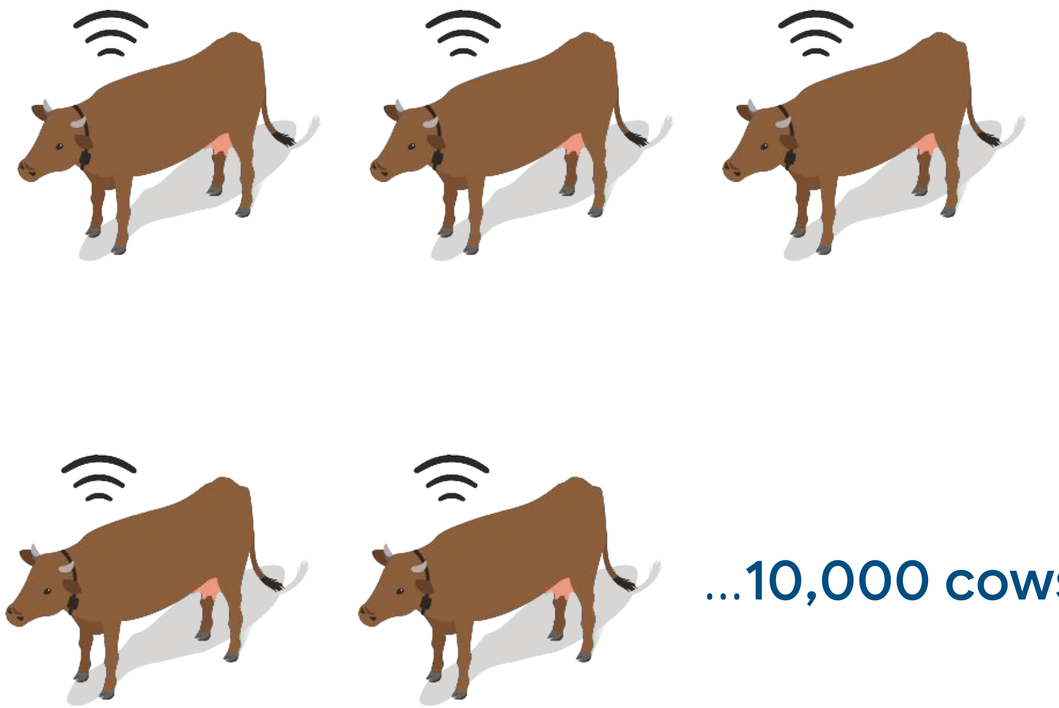


Internet

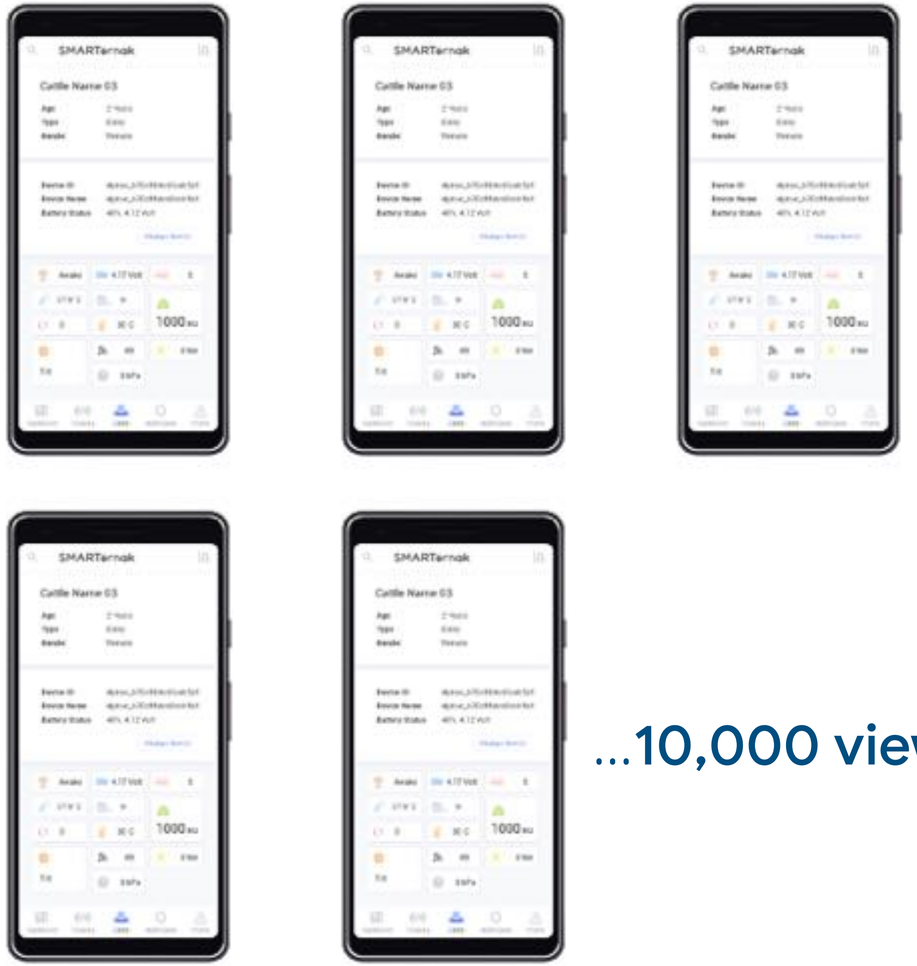


Monitoring

Now imagine...



...10,000 cows

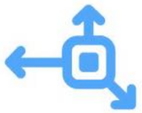


...10,000 views

Farmers may not need or understand raw data!

AI + IoT: Insights

This is where AI helps in SMARTernak.
Because cattle-farmer doesn't care about (raw) data

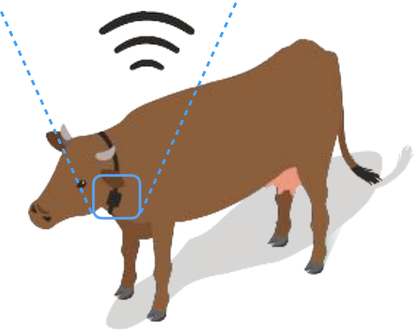


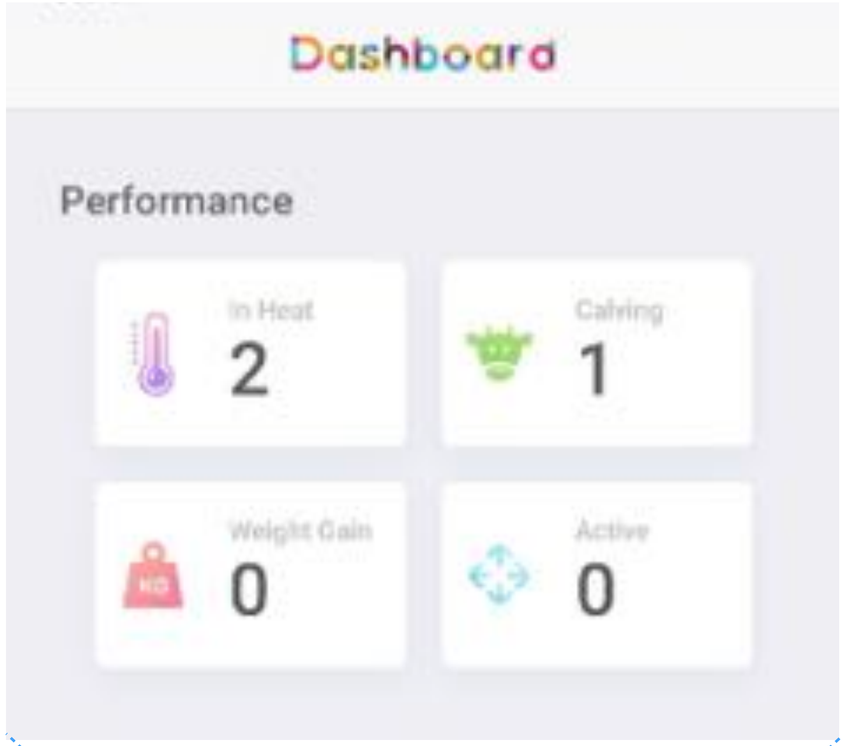
Accelerometer

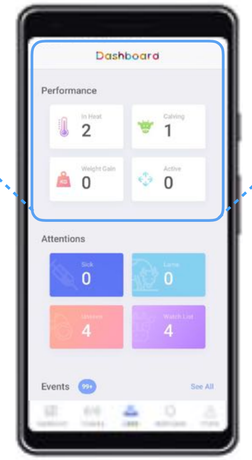
Gyro

Body Temperature

Chest Circumference







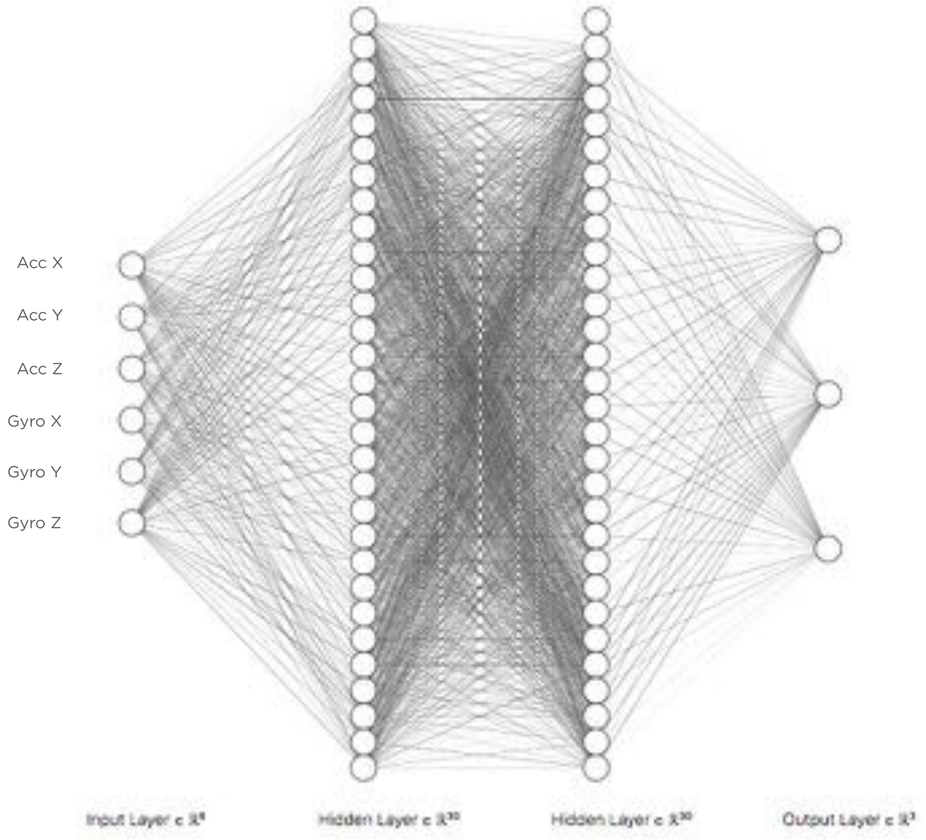
Mobile App

Artificial Intelligence at The Edge

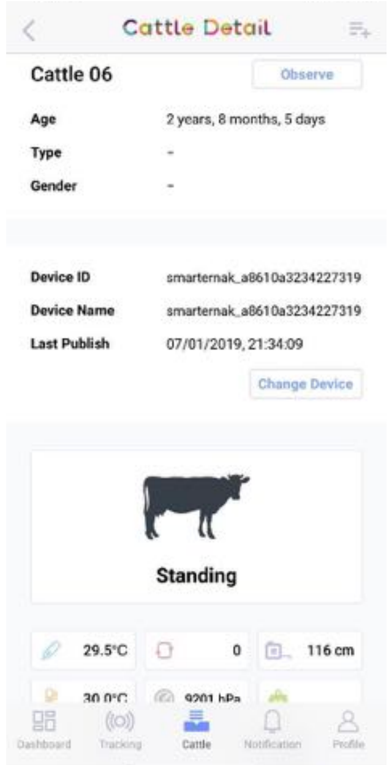
Learn & detect cattle behaviours to tailor **actionable insights & recommendation**
based on sensor data with the help of **on-device Artificial Intelligence**

IMU sensor

Motion captured by
Inertial Measurement Unit (IMU) sensor
inside cattle-wearable device



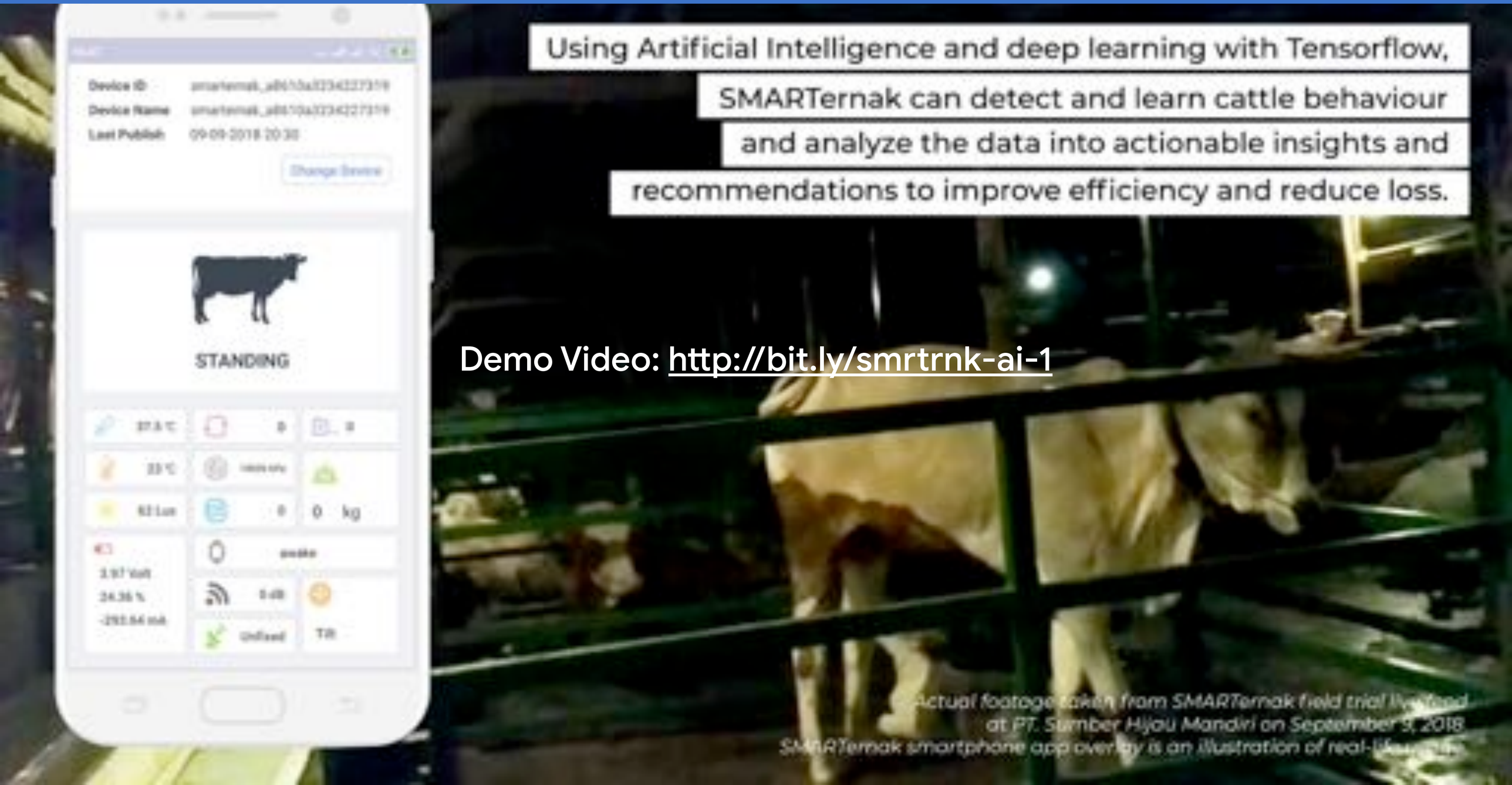
Deep Neural Network



App

Predicted activity
(standing, lying-down, feeding, and more)

On-device Activity Prediction



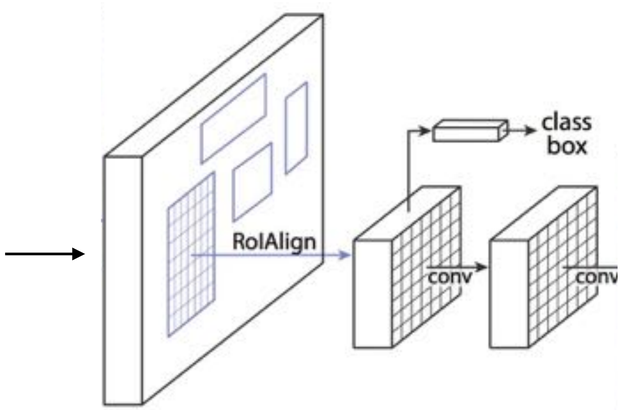
On-farm Smart Camera

*In development

On-farm Smart Camera

Cattle Counting & **Behaviour Analysis** using on-farm camera
with the help of **Machine Vision** & **on-device Artificial Intelligence**

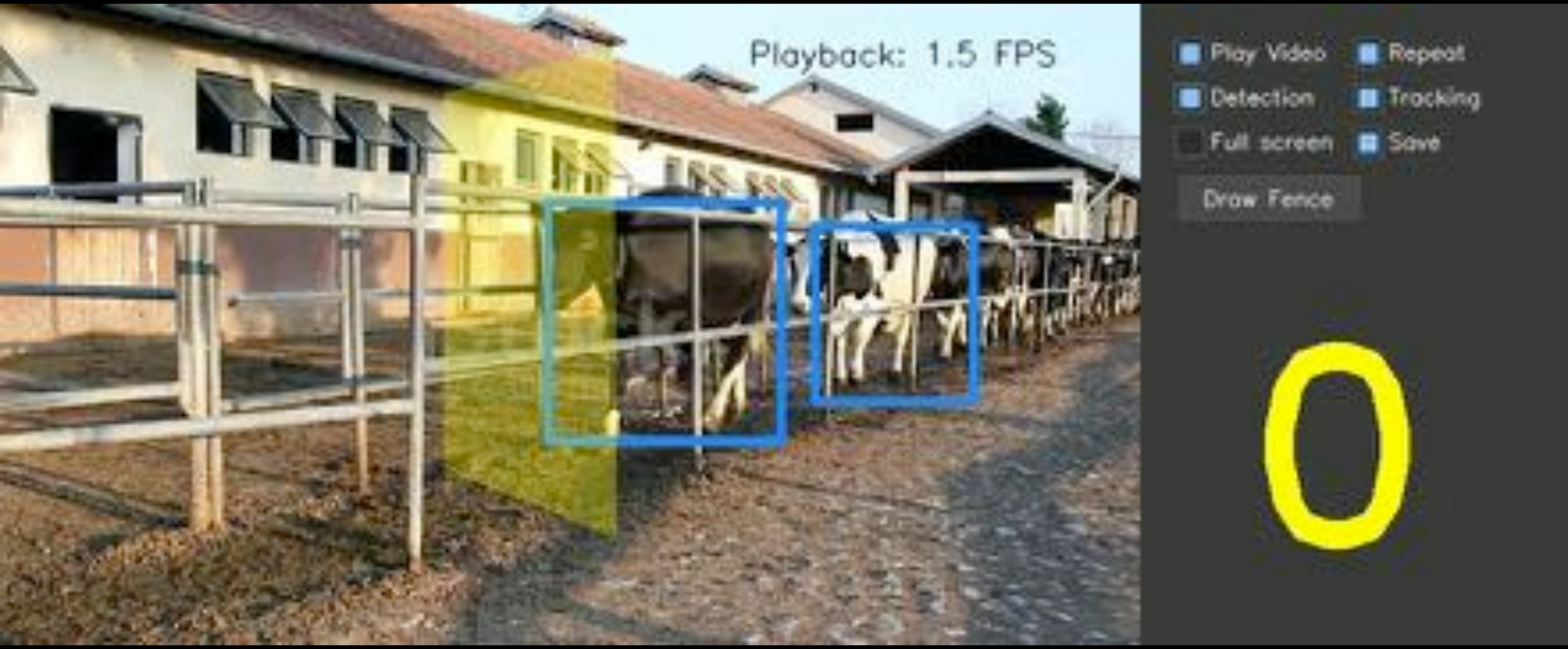
Image/video stream from camera



Deep Neural Network
(Instance Segmentation)

Detected cows and predicted activity
(standing, lying-down, feeding, ...)

Smart Camera - **Cattle Herd Counting**



Demo Video: https://youtu.be/Yk3O_HlmSK8

Smart Camera **Cattle Activity Recognition - Demo**

Demo Video: https://www.youtube.com/watch?v=hbiJhS3GftU

SMARTernak Solution - Variants & Features

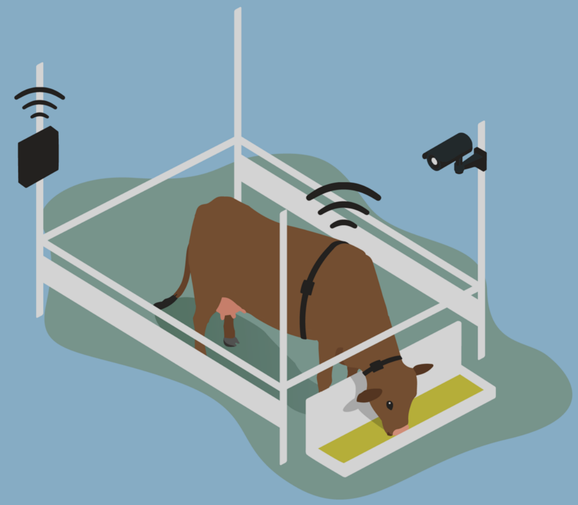
SMARTernak
Ultimate

SMARTernak
Tracking

for Extensive Farming

Free-ranging farming where mostly livestock grazes on large rangelands or pastures. Or, mixed crop-livestock farming: livestock grazes in the cropping area, such in integrated oil palm-ruminants system.

- Track location & behaviour
- Herd counting
- Virtual fencing



SMARTernak
Health

for Intensive Farming

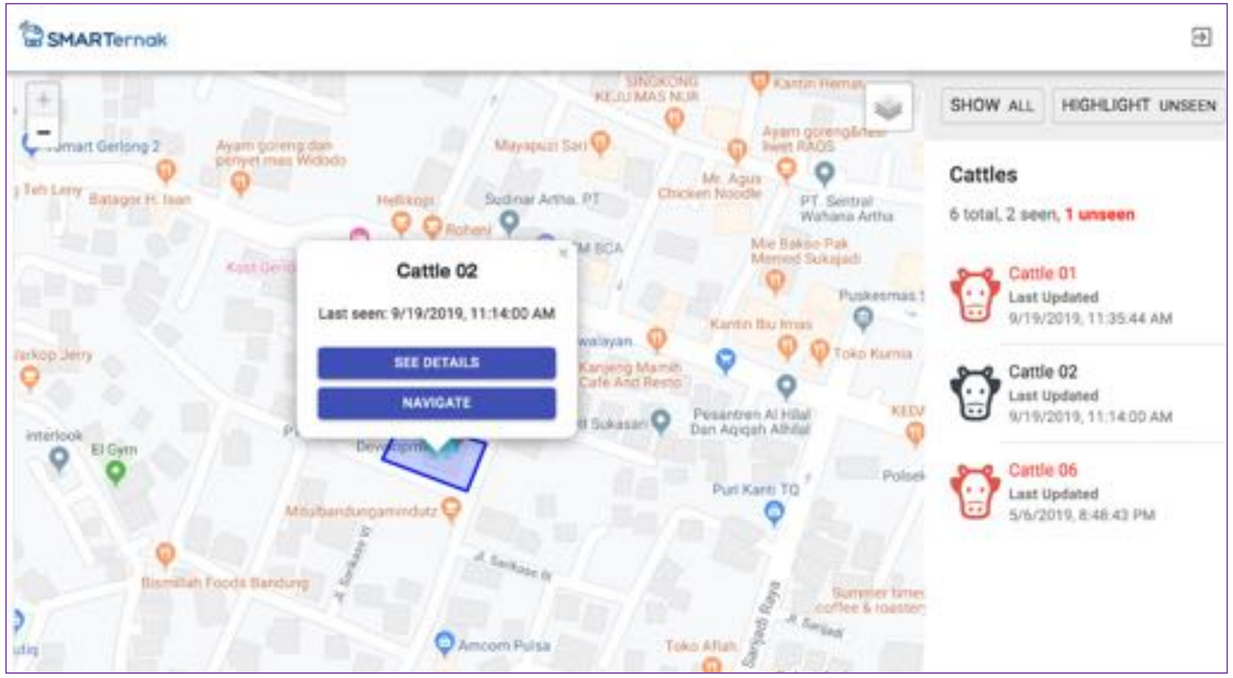
Livestock is confined in shed or barn and eat feed, or semi-confined which some graze in limited/small area in particular season. Mostly focus on fattening, breeding, or producing dairy products.

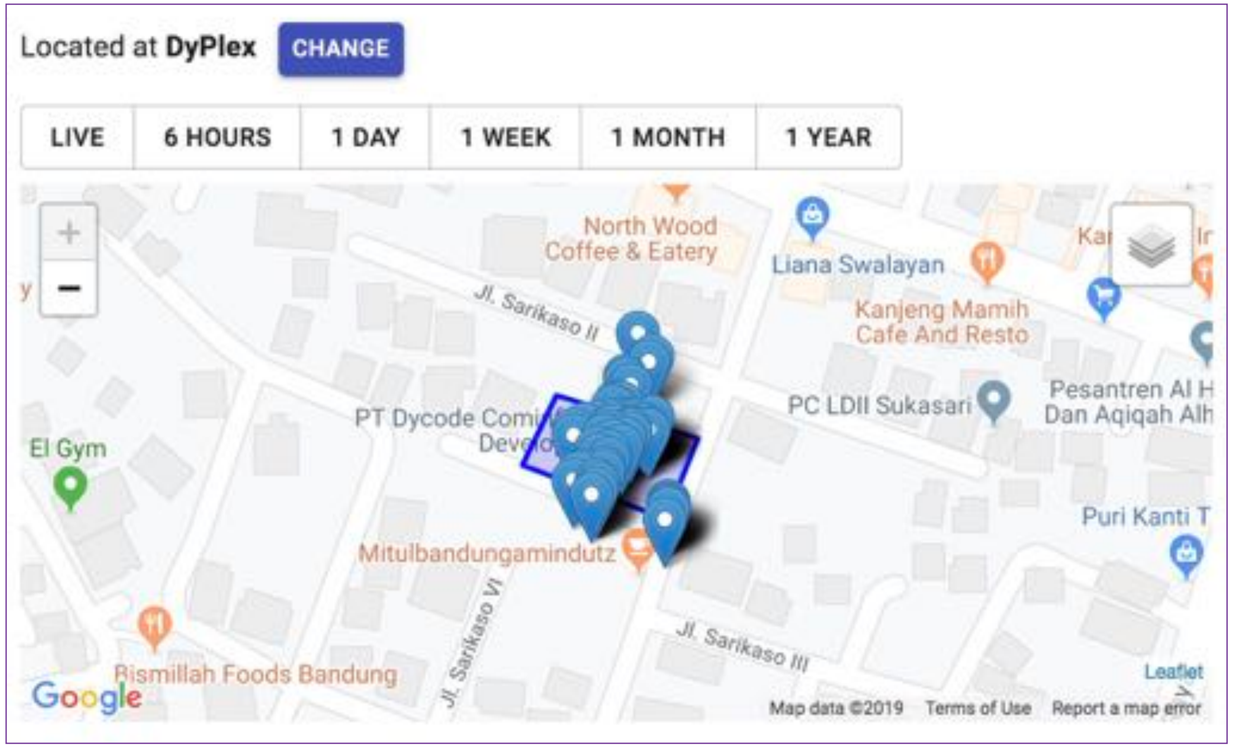
- Monitor & alert health issues
- Estimate weight*
- Learn behaviour (feeding, standing, walking, etc)
- Monitor environmental condition

Virtual Fencing Testing

Virtual Fencing Testing

Cattle Location Tracking





Precisely locate cattle position

Monitor the pattern and distribution of grazing activity

Virtual fencing:

Virtual and remote herding

Control grazing pattern

Precise herd counting, no cattle left behind

Tracking - Benefits

Animal welfare

Less or even no need physical fence,
esp. electrical fence that may cause trauma

No risk of cattle stuck in fence

Missing/left cattle can be identified and found in no time

Tracking - Benefits

Profit

Productivity increase:

No need to visually check cattle. Existing care-takers can handle more cattle, no need to add more.

Grazing pattern is controllable:

Ensure food source is sufficient for healthy cattle.
Give time for grass to grow.

No more missing cattle:

Prevent missing or stolen cattle

Less or not physical fence:

Reduce cost to install and maintain fence

SMARTernak: Live Demo

A Group Farm - Bantul, Yogyakarta, Indonesia

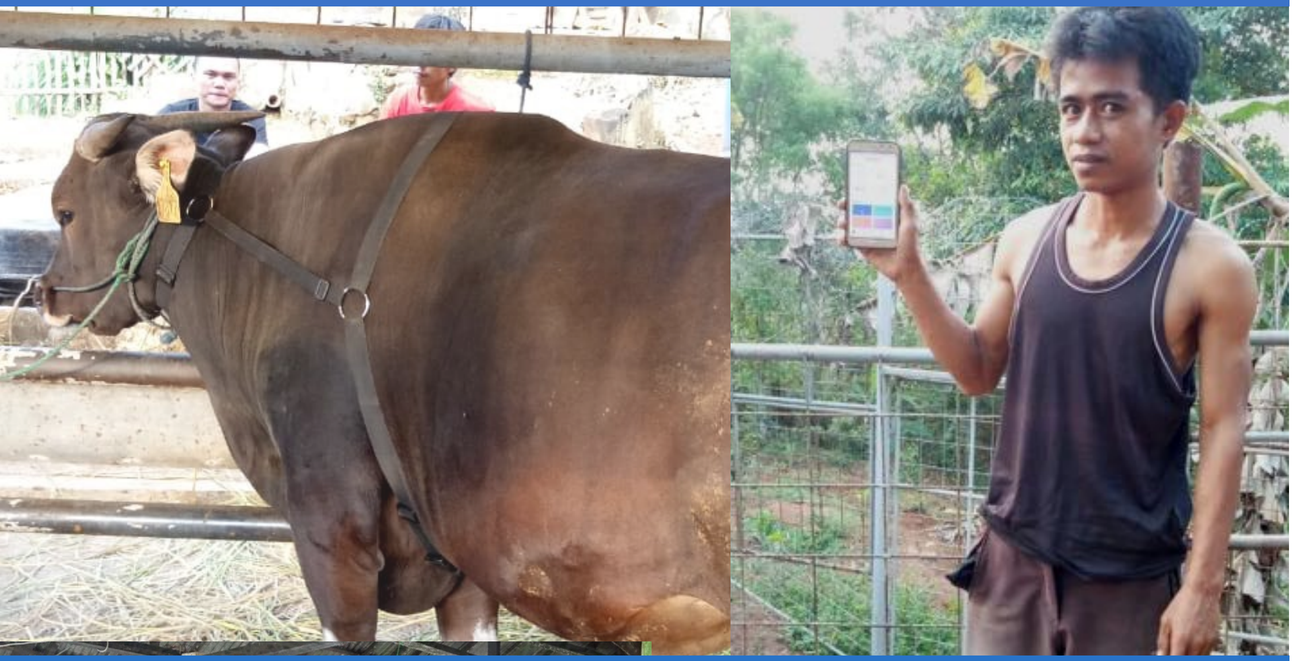
RJ Farm - Subang, West Java, Indonesia

SMARTernak
Real-World Implementation

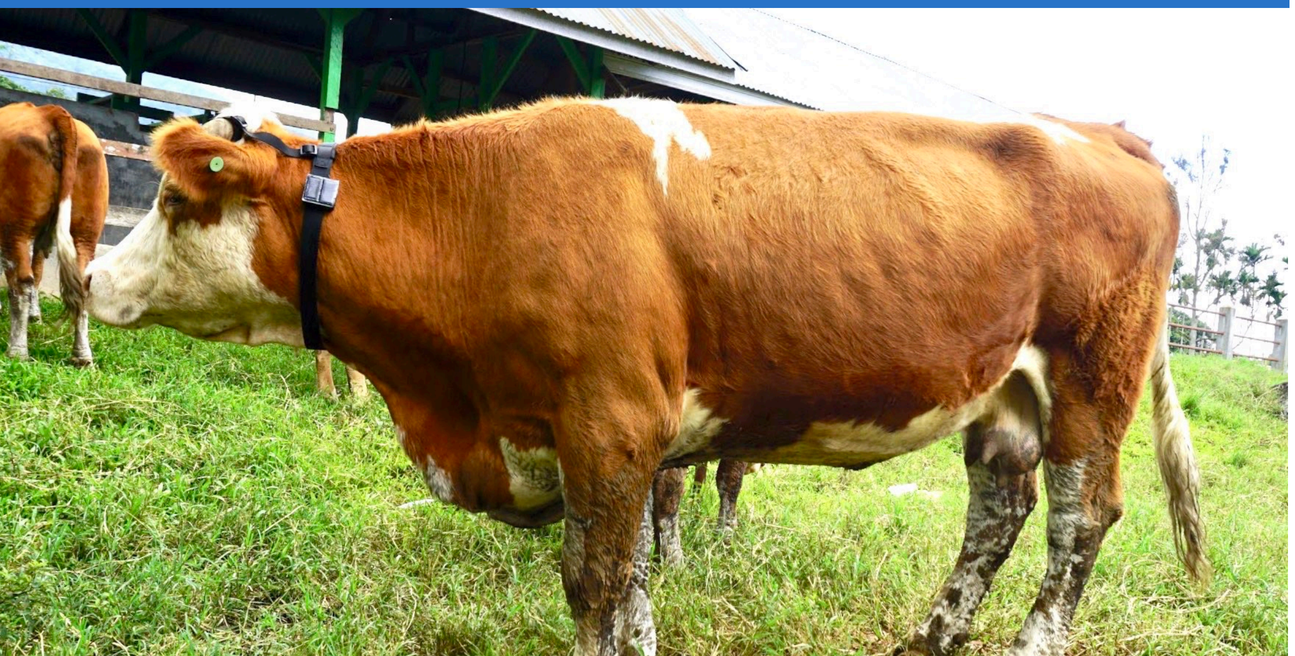
Sumber Hijau Mandiri - Majelengka, West Java, Indonesia

Ministry of Agriculture's Breeding Facility - West Sumatera

RJ Farm - Subang, West Java, Indonesia



Ministry of Agriculture’s Breeding Facility - West Sumatera, Indonesia



Don’t just take our word for it

> We can reduce the potential death of non-eating cows significantly, by the notification from the app. Now, I can sleep well.
>
> **Rahmat**
> Owner of RJ Farm, Subang, Indonesia

> We manage 1400 cows with 100 staffs. Now we can bread more cows and increase productivity, without adding more staffs.
>
> **Dr. Harry Suhada**
> Animal Breeding and Genetics Expert
> at Ministry of Agriculture, Indonesia

Coverage by Metro TV in Ciawi, Bogor

Watch here: http://video.metrotvnews.com/start/akWGwjLk-asli-lokal-kualitas-global-1

Pricing

Device Price

SMARTernak
Tracking
Never lose track of your cattle

Rp1.39 Million *

or

SMARTernak
Health
Monitor your cattle's well-being

Rp1.39 Million *

or

SMARTernak
Ultimate
All Tracking + Health features, in one device

Rp2.39 Million *

SMARTernak
Smart Camera
Monitor 5 cows at once (optional, coming soon)

Rp4.39 Million *

+ Base Station**: **Rp13.99** mil

+

Subscription

Rp83K

per cow, per month ***

Includes:

Access to web dashboard and mobile apps, and all future updates

Cloud subscription cost

Device warranty and support

* Price for **100+** quantity. MOQ **10 devices at $129**/device. Get up to **25% discount for 1000+**. Device is reusable.

** Base Station only needed if using **LoRa connectivity**. Only need one to cover **5km radius,** for **100+** devices.

*** For 100+ devices. Other volume, let's talk.

LET'S DO TRIAL

We understand that before the massive implementation,
customers often need to try the solution out first.

Let's discuss.

Implementation Phases

Field Trial

Limited implementation to try out the solution, and identify unique requirements

Device: 5 - 10 pcs

Duration: 1 - 3 months

Lessons-learned & Customization

Collect lessons-learned, feedback, and new requirements

Propose system design that accommodates customisation and improvement needed

Decide GO or NO GO

Develop new system design

Duration: 1 - 3 months

Real Implementation

Real and massive implementation

User assistance is provided

Device: upon request

Duration: 3 - 6 months

Ridwan Kamil, West Java Governor

ridwankamil • Follow

ridwankamil IMPLEMENTASI "DESA DIGITAL" MENERIMA AWARD OF EXCELLENCE 2019 dari OpenGOV, institusi internasional di bidang inovasi pemerintahan. .

INOVASI ini adalah salah satu yang mengangkat 537 desa naik kelas dari desa berkembang menjadi status desa maju dalam waktu 10 bulan.

Award ini didedikasikan untuk semua pihak yang bekerja keras melalui kolaborasi Pentahelix.

MARI SEMANGAT, jika desa juara maka insya Allah #JabarJuara.

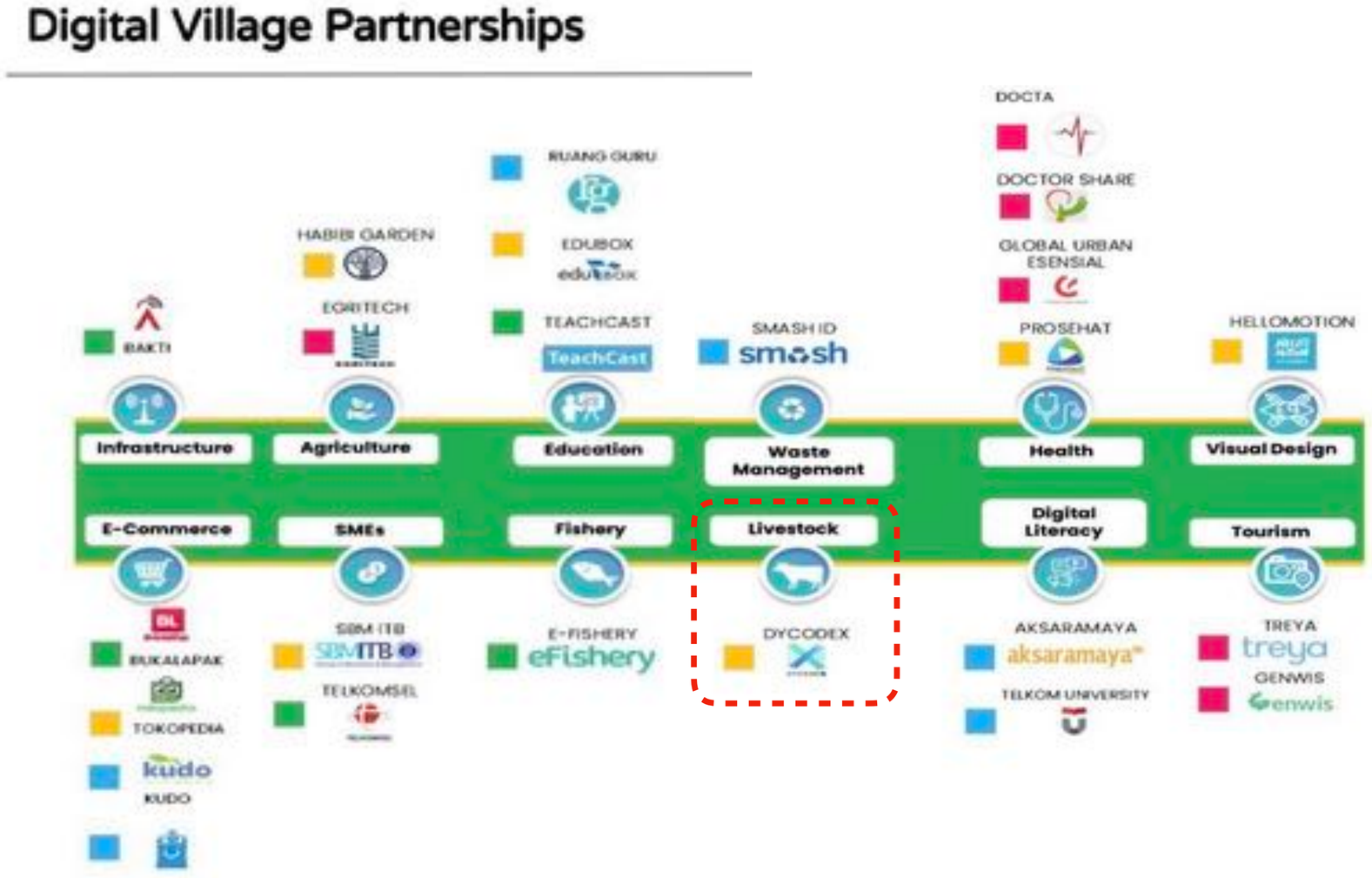
3d

56,804 likes

3 DAYS AGO

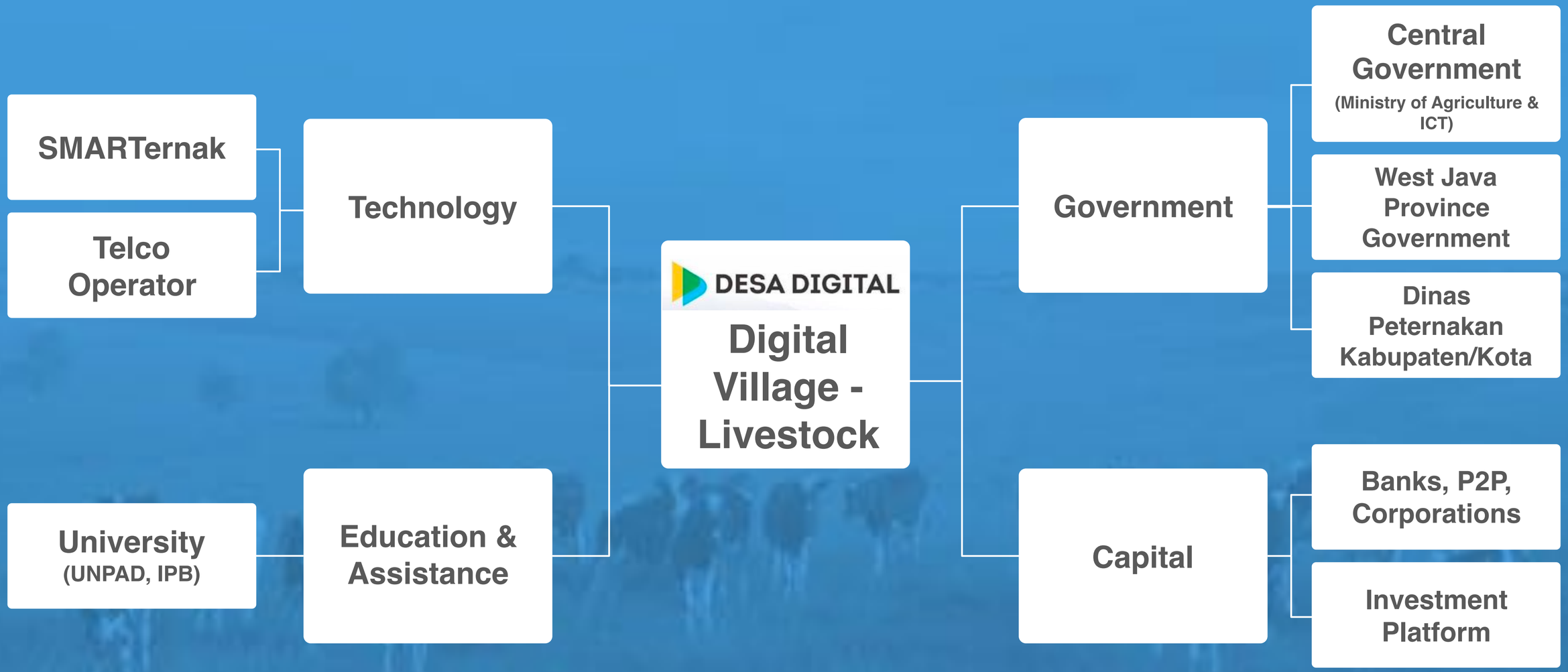
Log in to like or comment.

Digital Village



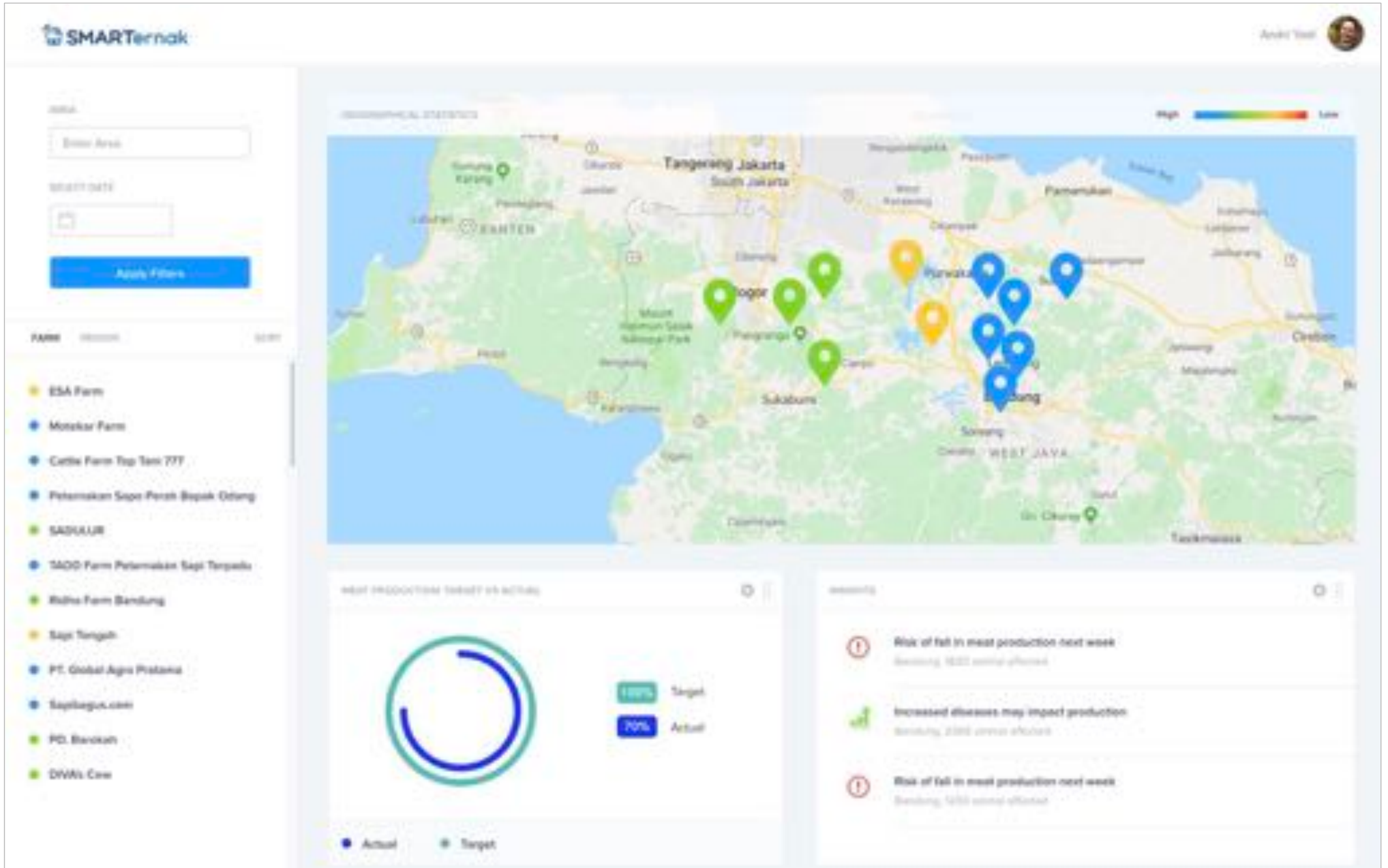
Digital Village - Livestock Farming

In progress to work with **West Java Government** - Digital Service Division, for an initiative of “Digital Village - Livestock” to tap the cattle farming potentials in West Java, which is the **2nd largest** in Indonesia



Contact us for more detail on the program

In the future...



DycodeX is much more than just SMARTernak and Agricultural space

Products & Solutions Focus

Home-grown AI & IoT-powered devices & platforms

DytraX:
Asset Tracking Platform

Smarterbike:
Bike Fleet Management
(e.g: bike sharing)

Asset tracking

SMARTernak
Cattle-farm assistant

Agriculture

AITrash
Smart Trash Management

Environment

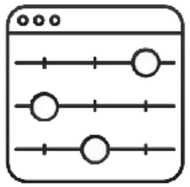
PowtraX
Electricity metering

Energy

Alora
Industrial Environmental Sensing

Machinery Health Sensor

Industrial IoT



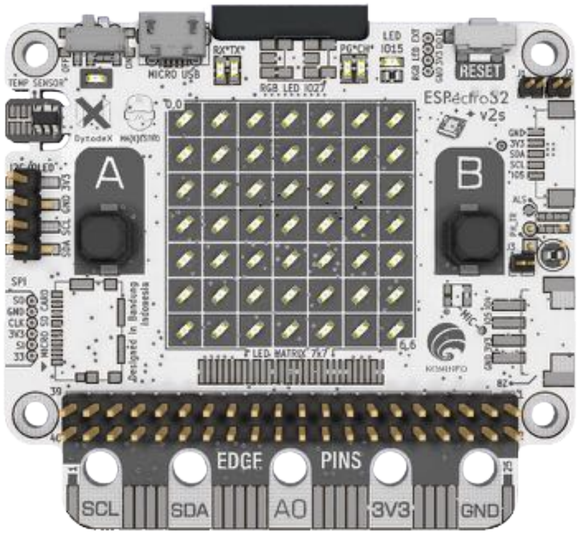
IoT Prototyping Platform for Education, Makers

Custom hardware design:
already helped 12 companies/startups

End-to-end AI + IoT development:
firmware, cloud, AI, web & mobile app

Design House

IoT Prototyping Platform for Education & Makers



ESPectro32

Backpacks

NB-IoT + GPS/GNSS Kit

LoRa/LoRaWAN + GNSS Kit

Sensors & Actuators Kit (20+ Peripherals)

3G + GNSS + Sensors

IoT Prototyping Platform

Optimized for learning STEM, coding & electronics, also for fast prototyping.

Already sold 1000+

Hardware:

ESPectro32: A development Board having highly capable, low-power dual-core Microcontroller, with built-in WiFi & Bluetooth connectivity

Extensible with Backpacks: NB-IoT/ Cellular, LoRa, Sensor Kits, Motor Driver, and more

Software:

Arduino Software-compatible, supported by ready-to-use libraries

Learn to code with:
Visual drag-and-drop blocks*
Swift Playground*

IoT Cloud: to easily connect IoT devices

All products' electronic board is designed & assembled **in-house** by **100% Indonesian**

* in development

Partners

Officially supported by
3 Ministries of Republic of Indonesia

KOMINFO

KEMENTERIAN PERTANIAN

Kementerian Perindustrian
REPUBLIK INDONESIA

Partnering with **global brands** for IoT R&D, component supply, mass production, and go to market

u-blox

AVNET

ERICSSON

WE WÜRTH ELEKTRONIK

SEMTECH

altair
A Sony Group Company

ESPRESSIF

LoRa Alliance™

life.augmented

muRata
INNOVATOR IN ELECTRONICS

Define Technology Develop Solution
DTDS
Technology Pte Ltd

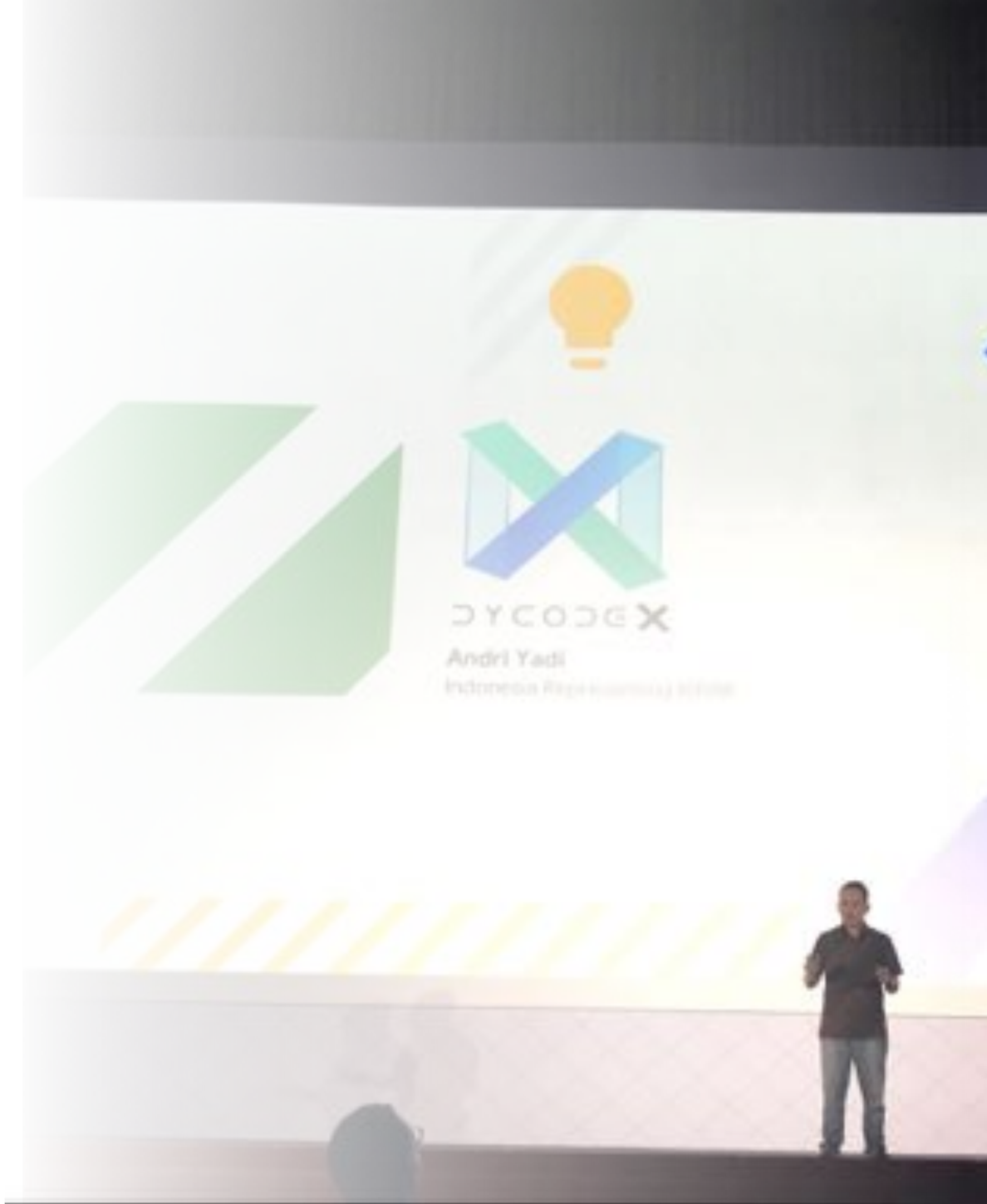
DEMO DAY

Google

SMARTernak terpilih sebagai satu-satunya produk dalam negeri yang mewakili Indonesia di ajang

Google Demo Day Asia 2018

Perjalanan panjang Kami:
https://dycodex.com/milestone/



Desa Digital dengan **SMARTernak**

Sehatkan Sapi, Sejahterakan Negeri

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Keep in touch

DYCODEX

AI + IoT enabler

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Bandung, Indonesia